

### **REMARKS**

The Office Action dated October 23, 2006 has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

Claims 38-74 have been amended to more particularly point out in distinctly claim the subject matter of the invention. New claim 75 is submitted, to recite aspects of the invention which was disclosed in the specification as originally filed. No new matter has been added. Claims 38-75 are respectfully submitted for consideration.

Claim 38-46 were rejected under 35 USC 102(b) as being anticipated by Cheong (WO 00/52845). As will be discussed below, each of the presently pending claims recite subject matter which is neither disclosed nor suggested in Cheong.

Independent claim 38, upon which claims 39-46 and 53 are dependent, is directed to a receiver configured to receive a plurality of signals. The receiver comprises a plurality of receiving elements, each of which is configured to receive a composite signal including at least some of the plurality of signals. The receiver receives the plurality of signals at the same time. A processor is configured to receive the plurality of receiving elements composite signal, and to provide an estimate of at least two of plurality of signals. The processor is configured to provide an estimate of a first one of the signals and to provide an estimate of a second one of the signals. The processor is configured, for each already determined estimate, to extend the estimate with a plurality of potential values. The estimate of second one of the signals takes into account the estimate of the

first signal and the estimate of the first signal is modified in dependence on the estimate of the second signal.

As a result of the claimed configuration of elements, embodiments of the present invention can maximize performance yet minimize complexity in reception of a composite signal. As will be discussed below, Cheong fails to disclose or suggest the elements of the claimed invention, and therefore fails to provide the advantages thereof.

Cheong discloses an iterative multi-user detection system. A fundamental purpose of Cheong is to reduce the impact of cross talk interference in multi-carrier data transmission systems. Cheong discloses receiving an input signal which includes a primary data signal and a superimposed cross talk signal which is received on a single wire or fixed line. Cheong discusses the configurations thereof as being a signal input/single output system, which can remove cross talk which can occur due to reflections during multiplexing or demultiplexing across an asynchronous digital subscriber line (ADSL). However, a person of ordinary skill in the art would understand that there is no disclosure or suggestion in Cheong of a plurality of receiving elements configured to receive a composite signal. The Office Action seems to take the position that decoder 1 and decoder 2 of Cheong are comparable to receiving elements according to the applicant's claims. However, the description of Cheong clearly shows only a single receiving element, refer to as "Y," from which the received signal is then split to be input into the two decoders, decoder 1 and decoder 2. Referring to Fig. 6 of Cheong, it can clearly be seen that receiver 604 only has one input thereto. It is therefore,

inappropriate to interpret Cheong as either disclosing or suggesting the claimed invention.

In other words, Cheong teaches a method where, within the receiver, the correct signal and each suspected interference signal requires a separate decoder. The output of each decoder is disclosed as being fed back to the input of other decoders. Therefore, in Cheong, each decoder attempts to produce a signal estimate, which can then be fed back to the other decoders so that the decoder associated with the correct signal can be more accurately determined, after allowing the suspected interference signal values transmitted at the same time. A person skill in the art would understand that Cheong discloses a hardware “brute force” approach to determine the correct signal. A configuration according to Cheong may be effective in cases such as that which is disclosed in the description thereof, where the number of suspected interference signals is relatively small. However, it would be impractical to use the teachings of Cheong in a configuration where numerous signals are received for numerous receiver elements, due to the significant and inefficient hardware requirements. For example, multiple input multiple output (MIMO) systems would be an environment where Cheong would be unsuitable. There is simply no disclosure or suggestion in Cheong of a plurality of receiving elements each of which is configured to receive a composite signal including at least some of a plurality of signals, wherein the receiver receives a plurality of signals at the same time. Cheong, therefore, fails to disclose or suggest a processor as recited in the presently pending claims, which is configured to provide an estimate of a first one of the

signals and an estimate of a second one of the signals, as well as the other limitations of the present claims. It is therefore respectfully submitted that each of claims 38-46 and 53 recites subject matter which is neither disclosed nor suggested in Cheong.

Claims 47-50, 52, and 56 were rejected under 35 USC 103 as being unpatentable over Cheong, and further in view of Hafeez (United States Patent No. 6,304,618). The Office Action took the position that Cheong discloses all of the elements of claim 38, as discussed above, but fails to disclose the specific elements of the dependent claims. The Office Action took the position that Hafeez disclosed these elements and that it would have been obvious to a person of ordinary skilled in the art to combine these references yield the claimed invention. Applicants respectfully submit, however, the each of claims 47-50, 52, and 56 recites subject matter which is neither disclosed nor suggested in Cheong and or Hafeez, when viewed either singularly or in combination.

Claim 47-50, 52, and 56 are all directly or indirectly dependent upon claim 38. As discussed above, Cheong fails to disclose or suggest the subject matter of independent claim 38; Cheong fails to disclose or suggest a plurality of receiving elements configured to receive a composite signal, including at least some of a plurality of signals, within a receiver which receives the plurality of signals at the same time.

Hafeez is directed to methods and systems for reducing co-channel interference using multiple timings for a received signal. Hafeez is only relied upon in the Office Action as disclosing these specific elements of the dependent claims. However, Hafeez fails to cure the significant deficiencies which exist in Cheong. Neither Hafeez nor

Cheong discloses or suggests a receiver as recited in claim 38. Therefore, in combination of Hafeez and Cheong cannot disclose or suggest the subject matter of any claims dependent thereupon.

Another words, the system of Cheong estimates a plurality of timings for a received signal wherein the plurality of timings correspond to a plurality of transmitted signals. The received signal is then sampled according to the plurality of timings, to produce a plurality of sample streams from the single received signal. Channel estimates are produced for the received signals, and metrics are computed using the sample streams and channel estimates. Referring to column 4 of Hafeez, multiple antennas can be used. A metric is determined, according to Hafeez, in order to use the joint maximum likelihood sequence to produce an estimate of the first and second signal based on a sample of the correlation function. Referring to column 6 of Hafeez, the metric is computed recursively using the metric from time “n” and the previous time, “n-1”. However, in addition to deficiencies noted above, there is no disclosure or suggestion within Hafeez of the determination of an estimate of the second signals taking into account the estimate of the first signal and the estimate of the first signal modified in dependence of the estimate of the second signal. It is therefore requested that this rejection be withdrawn.

Claim 51 is separately rejected under 35 USC 103(a) as being unpatentable over Cheong in view of Hafeez, and further in view of Decker (United States Patent No. 4,890,897). Claim 54 is rejected under 35 USC 103(a) as being unpatentable over

Cheong in view of Hafeez, and further in view of Zeira (United States Patent Publication No. 2002/0006122). In making these rejections, Cheong is used in an effort to illustrate the subject matter of claim 38, and the secondary and tertiary references of Hafeez/Decker and Hafeez/Zeira are cited as illustrating the subject matter of these dependent claims.

Decker discloses a multi-channel trellis encoder/decoder. Zeira discloses channel estimation for time division duplex communication systems. However, neither Hafeez, Decker, nor Zeira, when viewed either singularly or when combined with Cheong in any way, discloses or suggests a receiver as recited in claim 38. The prior art fails to disclose or suggest a receiver configured to receive a plurality of signals, with the receiver comprising a plurality of receiving elements each of which is configured to receive a composite signal including at least some of the plurality of signals, wherein the receiver receives a plurality of signals at the same time. Similarly, the cited prior art fails to disclose or suggest a processor configured as recited in the presently pending claims.

Furthermore, as discussed above, Cheong is directed to interactive multi-user detection systems. Hafeez, however, is directed to methods and systems for reducing co-channel interference using multiple timings for a received signal. It is respectfully submitted that there is simply no motivation in the art to combine Hafeez with Cheong in any way. Cheong, as discussed above, merely discloses systems for reducing impact of cross talk interference in multi-carrier data transmission systems. However, Cheong illustrates a configuration wherein there is only one input to a receiver. Hafeez, on the

other hand, is directed to producing a plurality of sample streams from a single received signal, where channel estimates are produced for the received signals, and metrics are computed using the sample streams and the channel estimates.

There is simply no disclosure nor suggestion, in the cited prior art, of a configuration recited in the presently pending claims. These significant distinctions, therefore, are more than sufficient to render the claimed invention unobvious to person of ordinary skilled in the art.

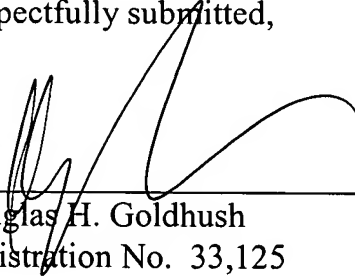
Applicants' note that claim 55 were objected to as being dependent upon rejected base claim, but otherwise indicated as being allowable. As discussed above, applicants respectfully submit that claim 55 should be found allowable in its current form.

In view of the above, applicants therefore respectfully request that each of the claims 38-75 be found allowable, and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicants' undersigned attorney at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,



---

Douglas H. Goldhush  
Registration No. 33,125

**Customer No. 32294**  
SQUIRE, SANDERS & DEMPSEY LLP  
14<sup>TH</sup> Floor  
8000 Towers Crescent Drive  
Tysons Corner, Virginia 22182-2700  
Telephone: 703-720-7800  
Fax: 703-720-7802

AMC:DHG:cmc:kh  
Enclosures: Additional Claim Fee Transmittal;  
Petition for Extension of Time (3 Mo.  
Check No. 16248